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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/020,887	12/19/2001	Tetsufumi Shima	060000-198	8810

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EXAMINER	
WILLIAMS, LAWRENCE B	
ART UNIT	**PAPER NUMBER**
2634	

DATE MAILED: 03/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/020,887	SHIMA ET AL.	
	Examiner	Art Unit	
	Lawrence B Williams	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 December 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,9-14 and 18-24* is/are rejected.

7)☒ Claim(s) *5-8 and 14-17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 August 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *1*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 4, 13, 21 - 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Yoshida (US Patent 6,282,233 B1).

(1) With regard to claim 4,Yoshida discloses in Fig. 1, a weighting coefficient determining method in a subtractive interference canceller adapted for digital radio communications, wherein the weighting coefficients are set so as to minimize the power of the interference cancellation residual signal for each channel in each stage (col. 9, lines 9-34).

(2) With regard to claim 13, Yoshida discloses in Fig(s). 1-3, an interference canceller

unit in a subtractive interference canceller for digital radio communications wherein the communication channel is composed of pilot bits, other control bits and data bits; comprising; adding means for receiving and adding an interference cancellation residual signal and a replica signal from a previous stage; despreading means for despreading the aforementioned addition signal by multiplying a spreading code of the user; correcting means for determining a fading vector and performing transmission path correction; tentative decision means for deciding on a symbol from the transmission path corrected signal; weighting means for multiplying a weighting coefficient to the tentative decision symbol; spreading means for respreading the tentative decision symbol by multiplying the spreading code of the user; and decorrecting means for determining a replica signal by multiplying the inverse of the transmission path properties to the respread signal (col. 5, lines 17-43); and wherein said weighting means determines a complex weighting coefficient such as to minimize the power of the interference cancellation residual signal for each channel in each stage (col. 8, lines 1-11; col. 9, lines 9-34).

(3) With regard to claim 21, claim 21 inherits all limitations of claim 4, above. Furthermore, Yoshida also discloses a weighting coefficient determining method according to claim 4, characterized in that said digital radio communications are code division multiple access (CDMA) communications (abstract).

(4) With regard to claim 22, claim 22 inherits all limitations of claim 13 above. Furthermore, Yoshida also discloses wherein said digital radio communications are code division multiple access (CDMA) communications (abstract).

(5) With regard to claim 23, claim 23 inherits all limitations of claim 10 above. Furthermore, Yoshida also discloses in Fig(s). 1-3, a parallel subtractive interference canceller

comprising a plurality of processing stages composed of a plurality of interference canceller units for handling a plurality of users (IEU), each stage aside from the final stage further comprising an adder (4-1, 2); wherein a replica signal is prepared by inputting a received signal and a zero value to each interference canceller unit in the first stage, and outputted to said adder and each interference canceller unit of the corresponding user in the next stage; a replica signal for each stage from the second stage to the next-to-last stage is prepared by inputting the interference cancellation residual signal in the previous stage and said replica signal of the previous stage to each interference canceller unit, and outputted to said adder and each interference canceller unit of the corresponding user in the next stage; and a replica signal is prepared in each interference canceller unit of the final stage by inputting the interference cancellation residual signal of the previous stage and said replica signal of the previous stages and outputted; and wherein the interference canceller unit of claim 13 is used (claims 1-32).

(6) With regard to claim 24, claim 24 inherits all limitations of claim 13. Furthermore, Yoshida also discloses in Fig(s). 1-3, a serial subtractive interference canceller comprising a plurality of stages composed of a plurality of interference canceller units for handling a plurality of users (IEU); wherein a replica signal is prepared by inputting a received signal and a zero value to the interference canceller unit of the first user in the first stage and outputted to the interference canceller unit of the corresponding user in the next stage, and the replica signal is subtracted from the received signal and the result is outputted to the interference canceller unit of the second user; a replica signal is prepared by inputting a signal subtracting replica signals from the first through previous users from the received signal and a zero value to the interference canceller unit of the second and subsequent users of the first stage, outputted

to the interference canceller unit of the corresponding user in the next stage, and the replica signal is subtracted from the received signal and the result outputted to the interference canceller unit of the next user; a replica signal is prepared by inputting an interference cancellation residual signal of the first stage instead of the received signal and the replica signal from the previous stage instead of a zero value to the interference canceller unit of the first user in the second stage, and outputted to the interference canceller unit of the corresponding user in the next stage, and the replica signal is subtracted from the received signal and the result outputted to the interference canceller unit of the second user; and a replica signal is prepared and outputted by performing the same procedure until the final stage; and wherein the interference canceller unit of claim 13 is used (claims 1-30).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 1 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Joo et al. (A Weighted Parallel Interference Cancellation Detector For Convolutionally Coded CDMA Systems).

Joo et al. discloses a weighting coefficient determining method in a subtractive Interference canceller for digital radio communications wherein the communication channel is

composed of pilot bits, other control bits and data bits; the weighting coefficient determining method being characterized in that the weighting coefficient λ_{AQ} of the pilots bits, the weighting coefficient λ_{BQ} of the other control bits and the weighting coefficient λ^{l} of the data bits are mutually independent values. Though Joo et al. does not explicitly make reference to the types of bits or symbols, he does teach a symbol-by-symbol weight determination (III. Symbol-by symbol Weight Determination Using LLR, pg. 1101-1102) which would inherently encompass all bits or symbols of the individual user including, pilot, control and data.

6. Claims 2, 3, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Joo et al. (A Weighted Parallel Interference Cancellation Detector For Convolutionally Coded CDMA Systems) as applied to claim 1 above, and further in view of Tanaka et al. (EP 0923199 A2).

(1) With regard to claim 2, as noted above, Joo et al. discloses all limitations of claim 1 above. Joo et al. does not however teach wherein the weighting coefficients are determined for each user and stage based on a tentative decision symbol and an average or instantaneous signal-to-interference ratio SIR.

However, Tanaka et al. teaches wherein the weighting coefficients are determined for each user and stage based on a tentative decision symbol and an average or instantaneous signal-to-interference ratio SIR [0059].

It would have been obvious to one skilled in the art at the time of invention to combine incorporate the teachings of Tanaka et al. with the teachings of Joo et al. as method of providing an interference canceller in which interference is eliminated taking into account the received

states of code-multiplexed signals of user channels so that improved transmission quality can be obtained [0028-0029].

(2) With regard to claim 3, Tanaka et al. also discloses in Fig(s) 8-10, a weighting coefficient determining method according to claim 2, wherein signal-to-interference ratios SIR_I and SIR_Q respectively of an I branch and a Q branch are used as the signal-to-interference ratio SIR and the weighting coefficients A^I and A^Q of the I branch and Q branch are derived from tentative decision symbol and a tentative decision error probability density function derived from the signal-to-interference ratios SIR_I and SIR_Q [0075,0081].

(3) With regard to claim 9, Joo et al. also discloses a weighting coefficient determining characterized in that said digital radio communications are code division multiple access (CDMA) communications (abstract).

7. Claims 10, 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida (US Patent 6,282,233 B1) in view of Joo et al. (A Weighted Parallel Interference Cancellation Detector For Convolutionally Coded CDMA Systems).

(1) With regard to claim 10, Yoshida discloses in Fig(s). 1-3, an interference canceller unit in a subtractive interference canceller for digital radio communications wherein the communication channel is composed of pilot bits, other control bits and data bits; comprising; adding means for receiving and adding an interference cancellation residual signal and a replica signal from a previous stage; despreading means for despreading the aforementioned addition signal by multiplying a spreading code of the user; correcting means for determining a fading vector and performing transmission path correction; tentative decision means for deciding on a

symbol from the transmission path corrected signal; weighting means for multiplying a weighting coefficient to the tentative decision symbol; spreading means for respreading the tentative decision symbol by multiplying the spreading code of the user; and decorrecting means for determining a replica signal by multiplying the inverse of the transmission path properties to the respread signal (col. 5, lines 17-43).

Yoshida does not however disclose wherein said weighting means outputs a weighting coefficient λ_{A^Q} of the pilots bits, a weighting coefficient λ_{B^Q} of the other control bits and a weighting coefficient λ^I of the data bits are mutually independent values.

However, Joo et al. teaches a symbol-by-symbol weight determination (III. Symbol-by symbol Weight Determination Using LLR, pg. 1101-1102) which would inherently encompass all bits or symbols of the individual user including, pilot, control and data.

It would have been obvious to one skilled in the art at the time of invention to incorporate the teaching of Joo et al. with the invention of Yoshida to incorporate the proven performance of the method for convolutionally coded CDMA systems (Conclusions, pg. 1103).

(2) With regard to claim 19, claim 19 inherits all limitations of claim 10 above. Furthermore, Yoshida also discloses in Fig(s). 1-3, a parallel subtractive interference canceller comprising a plurality of processing stages composed of a plurality of interference canceller units for handling a plurality of users (IEU), each stage aside from the final stage further comprising an adder (4-1, 2); wherein a replica signal is prepared by inputting a received signal and a zero value to each interference canceller unit in the first stage, and outputted to said adder and each interference canceller unit of the corresponding user in the next stage; a replica signal for each stage from the second stage to the next-to-last stage is prepared by inputting the

interference cancellation residual signal in the previous stage and said replica signal of the previous stage to each interference canceller unit, and outputted to said adder and each interference canceller unit of the corresponding user in the next stage; and a replica signal is prepared in each interference canceller unit of the final stage by inputting the interference cancellation residual signal of the previous stage and said replica signal of the previous stages and outputted; and wherein the interference canceller unit of claim 10 is used (claims 1-32).

(3) With regard to claim 20, claim 20 inherits all limitations of claim 10. Furthermore, Yoshida also discloses in Fig(s). 1-3, a serial subtractive interference canceller comprising a plurality of stages composed of a plurality of interference canceller units for handling a plurality of users (IEU); wherein a replica signal is prepared by inputting a received signal and a zero value to the interference canceller unit of the first user in the first stage and outputted to the interference canceller unit of the corresponding user in the next stage, and the replica signal is subtracted from the received signal and the result is outputted to the interference canceller unit of the second user; a replica signal is prepared by inputting a signal subtracting replica signals from the first through previous users from the received signal and a zero value to the interference canceller unit of the second and subsequent users of the first stage, outputted to the interference canceller unit of the corresponding user in the next stage, and the replica signal is subtracted from the received signal and the result outputted to the interference canceller unit of the next user; a replica signal is prepared by inputting an interference cancellation residual signal of the first stage instead of the received signal and the replica signal from the previous stage instead of a zero value to the interference canceller unit of the first user in the second stage, and outputted to the interference canceller unit of the

corresponding user in the next stage, and the replica signal is subtracted from the received signal and the result outputted to the interference canceller unit of the second user; and a replica signal is prepared and outputted by performing the same procedure until the final stage; and wherein the interference canceller unit of claim 10 is used (claims 1-30).

8. Claims 11-12, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida (US Patent 6,282,233 B1) in combination with Joo et al. (A Weighted Parallel Interference Cancellation Detector For Convolutionally Coded CDMA Systems) as applied to claim 10 in further view of Tanaka et al. (EP 0923199 A2).

(1) With regard to claim 11, as noted above, Yoshida in combination with Joo et al. discloses all limitations of claim 10 above. They do not however teach wherein the weighting coefficients are determined for each user and stage based on a tentative decision symbol and an average or instantaneous signal-to-interference ratio SIR.

However, Tanaka et al. teaches wherein the weighting coefficients are determined for each user and stage based on a tentative decision symbol and an average or instantaneous signal-to-interference ratio SIR [0059].

It would have been obvious to one skilled in the art at the time of invention to combine incorporate the teachings of Tanaka et al. with the teachings of Joo et al. as method of providing an interference canceller in which interference is eliminated taking into account the received states of code-multiplexed signals of user channels so that improved transmission quality can be obtained [0028-0029].

(2) With regard to claim 12, Tanaka et al. also discloses in Fig(s) 8-10, wherein signal-to-interference ratios SIR_I and SIR_Q respectively of an I branch and a Q branch are used as the signal-to-interference ratio SIR and the weighting coefficients A^I and A^Q of the I branch and Q branch are derived from tentative decision symbol and a tentative decision error probability density function derived from

(3) With regard to claim 18, claim 18 inherits all limitations of claim 10. Furthermore, Joo et al. also discloses wherein the digital radio communications are code division multiple access (CDMA).

Allowable Subject Matter

9. Claims 5-8, 14-17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

10. The following is a statement of reasons for the indication of allowable subject matter: The instant application discloses a weighting coefficient determining method and apparatus. The prior art fails to teach a method or apparatus wherein the weighting coefficients are derived based on the relationship expressed by the equation as disclosed in claims 5 and 14.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a.) Mesecher et al. discloses in US Patent 6,278,726 B1 Interference Cancellation In A Spread Spectrum Communication System.

b.) Ishizu et al. discloses in US 2002/0015438 A1 Spread –Spectrum Signal Receiver.

c.) Toda et al. discloses in US Patent 6,192,062 B1 Multistage Interference Canceller.

d.) Tanaka et al. discloses in US Patent 6,157,685 Interference Canceller Equipment And Interference Cancelling Method For In A Communication System.

e.) Seki et al. discloses in US Patent 6,473,451 B1 Signal To Interference Power Ratio Measuring Apparatus And Signal To Interference Power Ratio Measuring Method As Well Transmission Power Controlling Method Under CDMA Communication System.

f.) Shoji discloses in US Patent 6,404,759 B1 CDMA Multi-User Receiving Apparatus Including Interference Canceller With Optimal Receiving State.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence B Williams whose telephone number is 571-272-3037. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 571-272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lawrence B. Williams

lbw
March 8, 2005

Amanda Le

AMANDA T. LE
PRIMARY EXAMINER